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# An Analysis of Patent Application for TCM Intervention Treatment of Immune Diseases—Take China and Guangdong Province Patent as an Example

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**Abstract.** Immune diseases are a great threat to people's health. As a crucial component of Chinese medicine, TCM (Traditional Chinese Medicine) has many similarities with modern immune disease treatment in basic thinking and theory. Recently, it is found that TCM treatment has a positive effect on immune diseases treatment. To support the innovation and breakthrough of immune disease treatment, our paper focuses on the analysis of TCM intervention treatment of immune disease patents in China and Guangdong Province, respectively. It makes early warnings about patent risk management. Through the analysis, we figured out that there were three features in common: (1) the quantity of patent application in this area rose swiftly since 2013; (2) the main category of patent technology were concentrated on A61K36 group; (3) corporations and institutions were dominated applicants; (4) In China, the applicants were geographically centralized in Shandong, Beijing, Jiangsu; In Guangdong, the applicants generally assembled in Guangzhou, Dongguan, Foshan. In conclusion, there is a lack of core patents in this field. From the perspective of patent layout, Guangdong needs to increase foreign patent applications and develop more core patents to enhance its competitiveness in TCM intervention treatment of immune diseases.

**Keywords:** Traditional Chinese medicine; TCM intervention treatment of immune diseases; Patent strategic analysis.

## 1. Introduction

Immunology is one of the fastest-growing frontier disciplines in life sciences and medicine. In recent years, the application of Traditional Chinese Medicine (TCM) theory for the study of immune diseases has achieved significant therapeutic effects, such as treating rheumatism, tumors, and lupus erythematosus.

Regarding patent information, it is a strategic resource with sufficient information. According to statistics, 90% of patent documents are reported in the patent literature and few forms in other scientific literature. Through precise utilization of patent data, 60% time and 40% fund can be saved. "Technique patented, Patent standardized, Standard monopolized" has become the new international competition



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rules. According to present situation, there are many articles on the analysis of TCM's overall patent situation, but there is very little patent analysis on TCM's treatment of immune diseases. In order to protect the technological innovation achievements of Chinese medicine intervention in the treatment of immune diseases, and to achieve the sustainable development of related achievements and applications, we need to attach great importance to the development and use of patent information related to Chinese medicine interventions in the treatment of immune diseases. Constructing an intellectual property innovation service system of TCM interventional treatment of immune diseases will support biomedical engineering industry innovation in Guangdong, going to take the leading position in this field.

Guangdong Province has abundant resources and a deep foundation in TCM. This project carries out a patent search of technologies related to TCM intervention treatment of immune diseases at home and abroad and comprehensively analyzes this technology's research status in China, abroad, and in the world in the aspect of patent literature research. Besides, focusing on the patent situation in Guangdong Province, this paper analyzes the status of the applicants from Guangdong by understanding competitors' technology research and corresponding patent layout features to make timely patent warning and risk prevention. Based on objective analysis, we aim at putting forward the patent layout strategy and warning suggestion, which is expected to enhance the core competitiveness of the TCM industry in Guangdong Province.

## 2. Source of Patent Data and Retrieval Data

The following data comes from the Innography database and Guangdong Patent Big Data Application Service System, where foreign patent data is retrieved with Innography. Chinese patent data is retrieved with the Guangdong Patent Big Data Application Service System.

According to the proposed retrieval formula, we can get patent retrieval results of TCM intervention treatment of immune diseases from Guangdong, China, and abroad. Data retrieval date: April 14, 2016.

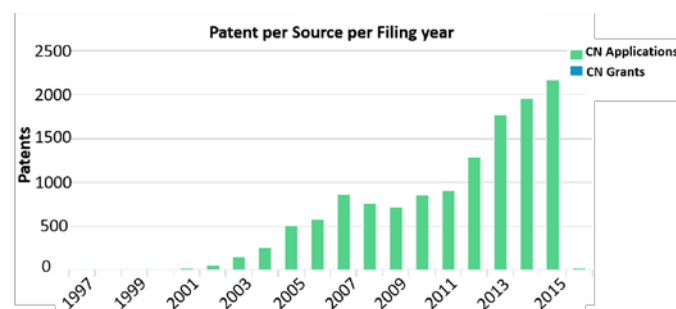
**Table 1.** Summary of patents for TCM intervention in immune diseases treatment.

Project Name	Overall patent applications	Total patent licensing	Proportion of patent licensing	Number of valid patents	Valid patent/Issued patent
China	12870	4135	32.13%	3020	73.04%
Abroad	1725	450	26.09%	340	75.6%
Guangdong	462	160	34.63%	122	76.25%

## 3. Analysis of Patent Application Status in China

### 3.1. The Trend of Patent Application in China

According to the Filing Year from statistics of 12870 Chinese patent applications retrieved, the trend of Chinese applications for TCM intervention of immune diseases in the past 20 years was obtained, shown in Figure 1.



**Figure 1.** Trend of patent application in China for TCM intervention of immune disease treatment.

From Figure 1, there were few patent applications in the 1990s. However, the number of applicants has increased steadily since 2001. After 2005, the average application quantity has exceeded over 500 each year. Moreover, the number of patent applications entered a period of rapid growth and rose above 1200 after 2012.

### 3.2. Analysis of Applicants

Through the patent big data application service system of Guangdong Province, the retrieved Chinese patents were analyzed in Figure 2.

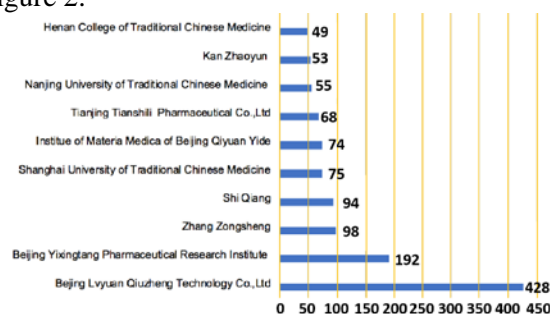


Figure 2. Statistical analysis of Chinese patent applicants.

In Figure 2, the applicants are mainly concentrated in enterprises and research institutions. Seven of the top ten applicants belong to research institutions or enterprises, such as Beijing Lvyuan Qiuzheng technology Co., Ltd (428 pieces), Beijing yixingtang pharmaceutical research institute (192 pieces), Shanghai University of Traditional Chinese Medicine (75 pieces). Meanwhile, considerable patents belong to natural persons like Zhang Zongsheng (98 pieces), Shi Qiang (94 pieces), Kan Zhaoyun (53 pieces), etc. (Note: the number of patent applications of Shanghai University of Traditional Chinese Medicine, Nanjing University of Traditional Chinese Medicine and Henan College of Traditional Chinese Medicine includes the number of patents for their affiliated hospitals).

### 3.3. Technical Distribution Analysis

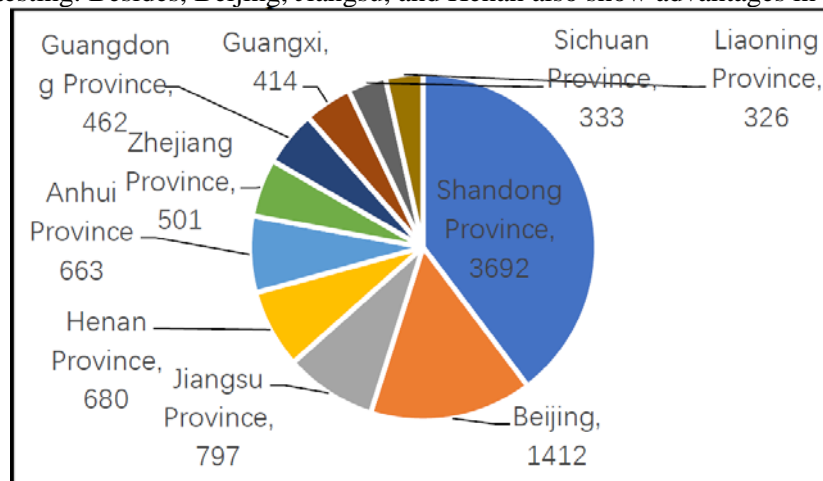
From Figure 3, we see the IPC distribution of TCM intervention treatment of immune disease patent in China. As shown in Figure 3, the Chinese patent IPC classification mainly involves the small class A61K of part A (medical, dental, or dressing with the distribution of products), specifically focusing on A61K36 (large group, Medicinal preparations of undetermined constitution containing material from algae, lichens, fungi or plants, or derivatives thereof, e.g. traditional herbal medicines), its largest rectangular area. Besides, these patents also cover A61P (specific therapeutic activities of compounds or pharmaceutical preparations). Other studies concentrate on A61P35 (anti-tumor drugs), A61P17 (drugs for skin diseases), and A61P29 (large group, non-central analgesics, antipyretics or anti-inflammatory agents, such as anti-rheumatic drugs, NSAIDs).



Figure 3. Classification analysis of China's patented technologies.

### 3.4. Geographical Analysis of Chinese Patent Application

Figure 4 illustrates the regional distribution of patent application for TCM intervention treatment of immune disease. Chinese patent application centralized on Shandong, Beijing, Jiangsu, and Henan Province. Herbal medicine is one of the five characteristic industries in Shandong Province who possesses 3692 patents in this field. The local government's Chinese medicinal materials development program are follows: the traditional Chinese medicine planting area will reach 3 million yields (output per acre) by 2020 and produce more than 15 billion RMB output value, up by 67%, among the highest in China. Moreover, they will establish 140 industrial science and technology demonstration parks, 60 standardized production bases, the new Shandong provincial engineering technology center of the protection and utilization, and the Shandong provincial engineering technology center for the quality inspection and testing. Besides, Beijing, Jiangsu, and Henan also show advantages in this field.



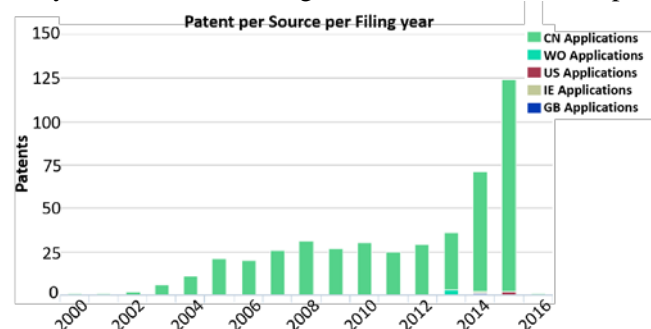
**Figure 4.** Geographical analysis of Chinese patent applications.

## 4. Analysis of Patent Status in Guangdong Province

### 4.1. Guangdong Patent Application Trend

According to the Filing Year from statistics of 462 patent applications retrieved in Guangdong Province, the trend of patent applications for TCM intervention treatment of immune disease in the last 20 years was shown in Figure 5.

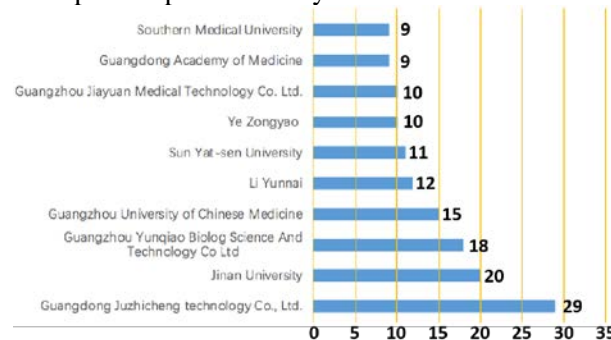
Figure 5 shows that Guangdong started to apply for patents in this field in 2000. It applied exceeded 20 patents each year since 2005. The number of patent applications grew steadily from 2005 to 2012 and speed up swiftly since 2013. Over 100 pieces of patents were applied in 2015. In 2013, there were three WIPO patent applications in Guangdong Province, two of which were applied by Xiao Mingchun and one by Zhang Lin. In 2014, Zhuhai New Century Medical Biotechnology Co., Ltd. issued a patent in UK and Ireland, respectively. In 2015, Xiao Mingchun laid out two related patents in the United States.



**Figure 5.** Trend chart of patent application in Guangdong Province for TCM intervention treatment of immune diseases.

#### 4.2. Applicant Analysis

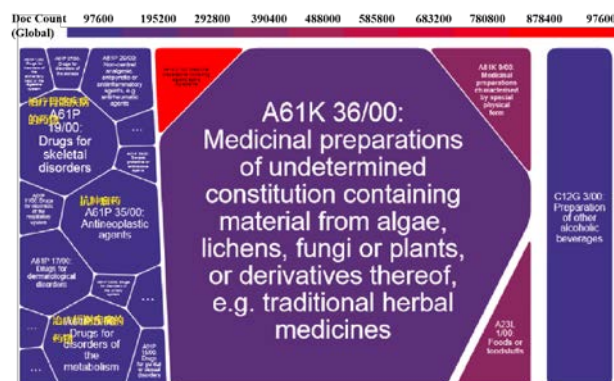
Through the big data application service system of Guangdong Province, Figure 6 demonstrated the most applied applicants in this field, including Guangdong Juzhicheng technology Co., Ltd, Jinan University, Guangzhou Yunqiao Biolog Science and Technology Co., Ltd, Guangdong University of Chinese Medicine, etc. Individuals with a large number of applications include Li Yunnai and Ye Zongyao. Note: the number of patents per university includes its affiliated hospitals.



**Figure 6.** Analysis of patent applicants in Guangdong Province.

#### 4.3. Technical Distribution Analysis

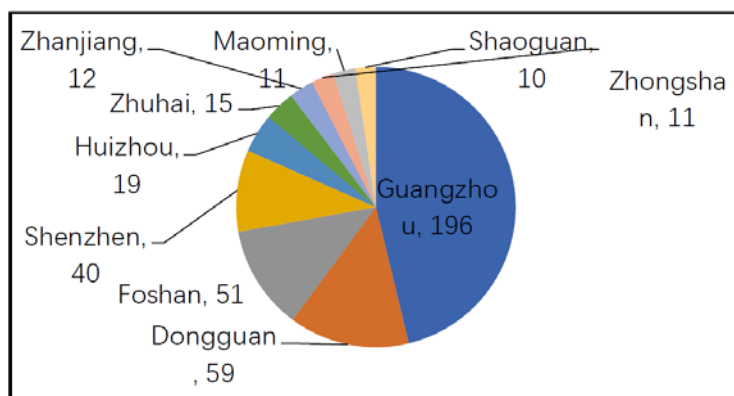
Figure 7 shows the IPC distribution of patents for TCM intervention treatment of immune diseases in Guangdong Province, which is similar to the patent statistics in China. It mainly focuses on A61K36 and A61P35. It also includes A61P19 (drugs for bone diseases) and A61P3 (drugs for metabolic diseases).



**Figure 7.** Patent technology analysis in Guangdong Province.

#### 4.4. Geographical Analysis of the Patent Application in Guangdong Province

As Figure 8 shows the geographical distribution of TCM intervention treatment of immune diseases, the main concentrated area is located in Guangzhou, Dongguan, Foshan, and Shenzhen. However, Guangzhou patent application accounts for 42.42% of the total in Guangdong Province, indicating that Guangzhou conducts more research and has a healthy R&D level in this field.



**Figure 8.** Geographical analysis of patent application in Guangdong Province.

## 5. Conclusion

(1) The patent application of TCM intervention treatment of immune diseases in Guangdong Province started in 2000, but the application rose slowly before 2012, and it began to increase significantly after 2013. But foreign patents have not yet been laid out.

(2) Among the patent applicant analysis, we found that corporations or universities like Guangdong Juzhicheng Co., Ltd and individual applicants like Li Yunnai were the highest quantity appliers. Guangdong Juzhicheng Co., Ltd's patent application was still in the early stage between 2014 and 2015, dealing with the treatment of osteopenia, diabetes, rheumatoid arthritis, and other diseases. Moreover, Guangzhou Yunqiao Biolog Science and Technology Co., Ltd's patent applications of this field were all concentrated in 2013, and these patents covered many disease treatments, including chronic nephritis, diabetes, urticaria, hyperosteo genesis, and vitiligo. However, Jinan University has applied for patents in this field earlier, mainly for disease treatment of cancer, diabetes, osteoporosis, and other diseases. Moreover, Guangzhou University of Traditional Chinese Medicine has earlier research in this field since 2005, mainly involving the treatment of diabetes, psoriasis, eczema, atopic dermatitis, and other diseases. Through comparison, we found that Guangzhou University of Chinese Medicine had the best proportion of patent authorization and effective ratio, and owns three high-strength patents, indicating its competitiveness in this field.

(3) By analyzing the inventors of patents in Guangdong Province, we discovered that three of the top ten inventors were from enterprises, five were from universities, and two were individuals. The companies to which the first two inventors belong are also the principal patent applicants. They are Guangdong Juzhicheng Technology Co., Ltd. and Guangzhou Yunqiao Biolog Science and Technology Co., Ltd., respectively. Moreover, the colleges to which the inventor belongs are mainly Guangdong Medical College and Jinan University.

(4) Patent technology distribution in Guangdong Province is primarily focused on A61K36 (contain from algae, mosses, fungi or plants or their derivatives) and A61P35 (antineoplastic agent), in addition, technical categories also pay attention to A61P19 (for bone disease drugs) and A61P3 (for metabolic diseases).

(5) Through the patent technology analysis, we learned that Guangdong Juzhicheng Technology Co., Ltd.'s patent researched technique was mainly about treating diabetes and kidney disease caused by diabetes. Other patents involve in "Rhizoma Drynariae" ingredients of Chinese medicine preparations such as the main treatment of osteoporosis or diseases like rheumatoid arthritis; Jinan University mainly participates in the research on the extraction methods or techniques of the active components of TCM, such as the preparation of antitumor traditional Chinese medicine extracts and the preparation of traditional Chinese medicine compositions for the treatment of osteoporosis; Guangzhou Yunqiao Biolog Science and Technology Co., Ltd has more extensive research on bone hyperplasia, diabetic, rheumatoid arthritis, chronic nephritis, urticaria, leukoderma, and so on; Guangzhou University of Chinese Medicine's research mainly focuses on the treatment of diabetes, psoriasis, eczema, atopic dermatitis and other diseases, especially in oral dosage forms.

(6) At present, no patent litigation or objection has been found against the patents of Guangdong Province, and there was a lack of core patent in this field in Guangdong Province.

## 6. Future Work

Next, we intend to investigate the specific conditions and related drugs of patent-related enterprises that intervene in the treatment of immune diseases by traditional Chinese medicine, so as to conduct a more in-depth analysis of the conversion of patent results.

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